

Exercise habituation is effective for improvement of periodontal disease status: a prospective intervention study

Background and purpose: Periodontal disease is closely related to lifestyle-related diseases and obesity. It is widely known that moderate exercise habits lead to improvement in lifestyle-related diseases and obesity. However, little research has been undertaken into how exercise habits affect periodontal disease. The purpose of this study was to examine the effect of exercise habits on periodontal diseases and metabolic pathology.

Methods: We conducted a prospective intervention research for 12 weeks. The subjects were 71 obese men who participated in an exercise and/or dietary intervention program. Fifty subjects were assigned to exercise interventions (exercise intervention group) and 21 subjects were assigned to dietary interventions (dietary intervention group). This research was conducted before and after each intervention program.

Results: In the exercise intervention group, the number of teeth with a probing pocket depth (PPD) ≥ 4 mm significantly decreased from 14.4% to 5.6% ($P < 0.001$), and the number of teeth with bleeding on probing (BOP) significantly decreased from 39.8% to 14.4% ($P < 0.001$). The copy counts of *Tannerella forsythia* and *Treponema denticola* decreased significantly ($P = 0.001$). A positive correlation was found between the change in the copy count of *T. denticola* and the number of teeth with PPD ≥ 4 mm ($P = 0.003$) and the number of teeth with BOP ($P = 0.010$). A positive correlation was also found between the change in the copy count of *T. denticola* and body weight ($P = 0.008$), low-density lipoprotein cholesterol ($P = 0.049$), and fasting insulin ($P = 0.041$). However, in the dietary intervention group the copy count of *T. denticola* decreased significantly ($P = 0.007$) and there was no correlation between the number of periodontal disease-causing bacteria and PPD and BOP.

Conclusion: Our results are the first to show that exercise might contribute to improvements in periodontal disease.

Keywords: bacteria, intervention studies, lifestyle, metabolic syndrome, obesity, periodontal disease, periodontal status

Table 1 Results of the questionnaire survey and medical interview pre- to postintervention

Variable	Preintervention	Postintervention	P-value
Exercise intervention group (n=50)			
Number of brushings per day (times)*	2	2	0.807
Brushing time per day (minutes)*	6	6	0.206
Use of auxiliary instrument (floss interdental brush, etc.) (%)**	24	26	0.817
Regular visit to a dental office (%)**	20	20	1.000
Gingival bleeding during tooth brushing (%)**	28	24	0.648
Teeth stinging (%)**	24	36	0.190
The gingiva retracted and the tooth became longer (%)**	18	24	0.461
Dietary intervention group (n=21)			
Number of brushings per day (times)*	2	2	0.180
Brushing time per day (minutes)*	6	7	0.937
Use of auxiliary instrument (floss interdental brush, etc.) (%)**	24	29	0.726
Regular visit to a dental office (%)**	24	24	1.000
Gingival bleeding during tooth brushing (%)**	29	33	0.739
Teeth stinging (%)**	24	33	0.495
The gingiva retracted and the tooth became longer (%)**	33	33	1.000

Table 2 Periodontal disease tests and bacterial quantities, amount of change from pre- to postintervention

Variable	Preintervention	Postintervention	Change	P-value
Exercise intervention group (n=50)				
Number of remaining teeth	27.0 \pm 3.9	27.0 \pm 3.9	0	0.317
Number of teeth with PPD ≥ 4 mm (%)	14.4 \pm 12.9	5.6 \pm 8.5	-8.8	<0.001*
Number of BOP positive teeth (%)	39.8 \pm 18.0	14.4 \pm 7.7	-25.4	<0.001*
<i>Porphyromonas gingivalis</i> ($\times 10^3$ copy/5 μ L saliva)	11,370.9 \pm 16,961.0	13,615.8 \pm 21,216.9	2,245.0	0.449
<i>Tannerella forsythia</i> ($\times 10^3$ copy/5 μ L saliva)	1,416.4 \pm 2,000.9	747.8 \pm 958.6	-668.6	0.001*
<i>Treponema denticola</i> ($\times 10^3$ copy/5 μ L saliva)	377.4 \pm 521.9	191.7 \pm 533.9	-185.7	0.001*
Dietary intervention group (n=21)				
Number of remaining teeth	27.0 \pm 6.1	27.0 \pm 6.1	0	0.180
Number of teeth with PPD ≥ 4 mm (%)	12.5 \pm 18.7	9.1 \pm 27.0	-3.4	0.246
Number of BOP positive teeth (%)	39.6 \pm 17.5	48.7 \pm 28.6	9.1	0.092
<i>P. gingivalis</i> ($\times 10^3$ copy/5 μ L saliva)	20,456.3 \pm 24,326.8	33,118.2 \pm 47,638.1	12,661.9	0.007*
<i>T. forsythia</i> ($\times 10^3$ copy/5 μ L saliva)	4,933.8 \pm 5,614.6	6,107.8 \pm 1,829.8	1,174.0	0.357
<i>T. denticola</i> ($\times 10^3$ copy/5 μ L saliva)	500.0 \pm 619.8	294.4 \pm 435.8	-205.6	0.023*